INTEX-B DC-8
Instrumentation for HiGEAR research group A. Clarke (University of Hawaii)
http://www.soest.hawaii.edu/HIGEAR/ (in conjunction with B. Anderson, LaRC)

Objective: We propose to evaluate size-resolved aerosol physiochemistry and its links to aerosol optical properties during INTEX-B and will operate/co-ordinate our University of Hawaii' instrument package in conjunction with that of NASA Langley (Bruce Anderson et al., LARGE). We employ aerosol sizing instruments equipped with thermal processing to identify volatile and refractory sizes. We will also measure the light scattering and absorbing properties of the aerosol including the humidity dependence of light scattering [so-called f(RH)]. The latter is related to the soluble and insoluble components of the aerosol that are linked to the measured volatile and refractory components. The full dry size distribution from 0.007 to 10.0 μm will be characterized. The smaller sizes, their state of mixing and their size-evolution will be measured using our Volatility Tandem Differential Mobility Analyzer (VTDMA). Larger sizes and their volatile and refractory components will be measured with our thermal Optical Particle Counter (OPC) and Aerodynamic Particle Sizer.

1) A size-resolved thermo-optic aerosol discriminator (30 s avg.):
In order to characterize the aerosol size distribution from 0.12 up to 7.0 μm, often where most aerosol mass, surface area and optical effects are dominant, we have a modified commercial Laser Optical Particle Counter (OPC) system to provide 256 size channels of data. A computer controlled thermal conditioning system is used upstream of the OPC (airstream dilution dried) which results in a system that operates as a Thermo-Optic Aerosol Discriminator (TOAD). The TOAD is used to characterize aerosol components volatile at temperatures associated with sulfuric acid (150C), ammonium sulfate/bisulfate (300C) and refractory aerosol at 300C (sea salt, dust and soot/flyash). Volatility observations can be combined with bulk aerosol chemistry to generate size-resolved information of the composition, state of mixing and refractive indices. A paper describing this system, its calibration and results can be found in Clarke, 1991.

2) Condensation Nuclei - heated and unheated (available at 1Hz)
Two butanol based condensation nuclei (CN) counter (TSI 3010) have been modified for aircraft use and count all particles between 0.01-3.0 um. In this fashion we obtain total CN, refractory CN (those remaining at 300C after sulfate is removed) and volatile CN (by difference) as a continuous readout. The ratio of refractory to total CN can be used as a fundamental indicator for air mass variability since it is not directly dependent on aerosol concentration. Polluted and continental aerosol often have ratios near about 0.8 whereas more pristine regions tend to be low ratios often approaching zero (Clarke et al.,